

# CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: December 22, 2021

TO: Sean Spencer – SCR/Fitchburg

FROM: Sarah Luck – SCR/Fitchburg

SUBJECT: Water Quality-Based Effluent Limitations for the Lodi Wastewater Treatment Facility  
WPDES Permit No. WI-0022918-10

This is in response to your request for an evaluation of the need for water quality-based effluent limitations (WQBELs) using chapters NR 102, 104, 105, 106, 207, 210, 212, and 217 of the Wisconsin Administrative Code (where applicable), for the discharge from the Lodi Wastewater Treatment Facility in Columbia County. This municipal wastewater treatment facility (WWTF) discharges to Spring Creek, located in the Lake Wisconsin Watershed in the Lower Wisconsin Basin. This discharge is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. The evaluation of the permit recommendations is discussed in more detail in the attached report.

Based on our review, the following recommendations are made on a chemical-specific basis at Outfall 001:

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD <sub>5</sub> May – October			35 mg/L 180 lbs/day	30 mg/L		2
November – April			45 mg/L	30 mg/L		
TSS May – October			35 mg/L 180 lbs/day	30 mg/L		2
November – April			45 mg/L	30 mg/L		
pH	9.0 s.u.	6.0 s.u.				2
Dissolved Oxygen May – October		6.0 mg/L				2
Ammonia Nitrogen May – September	6.3 mg/L		6.3 mg/L	5.2 mg/L		2
October – April	6.3 mg/L		6.3 mg/L	6.3 mg/L		
Bacteria						3
Interim Limit Fecal Coliform				400 #/100 mL geometric mean		
Final Limit <i>E. coli</i>				126 #/100 mL geometric mean		
Chloride						4
Phosphorus				1.0 mg/L 2.0 lbs/day	0.6 mg/L	5
TKN, Nitrate+Nitrite, and Total Nitrogen						6

Footnotes:

1. Monitoring only.
2. No changes from the current permit.
3. Bacteria limits apply during the disinfection season of May through September. The fecal coliform interim limit will apply until the end of the compliance schedule when *E. coli* limits take effect. Additional final limit: No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 count/100 mL.
4. Monitoring at a frequency to ensure that 11 samples are available at the next permit issuance.
5. The phosphorus mass limit is based on the Total Maximum Daily Load (TMDL) for the Wisconsin River Basin to address phosphorus water quality impairments within the TMDL area. The TMDL limit based on site-specific criteria is 2.0 lbs/day as a monthly average. The concentration limits of 1.0 mg/L, based on the technology-based effluent limit (TBEL), and 0.6 mg/L were previously in effect and are retained to prevent backsliding.
6. As recommended in the Department's October 1, 2019 Guidance for Total Nitrogen Monitoring in Wastewater Permits, annual total nitrogen monitoring is recommended for all minor municipal permittees. Total Nitrogen is the sum of nitrate (NO<sub>3</sub>), nitrite (NO<sub>2</sub>), and total kjeldahl nitrogen (TKN) (all expressed as N).

Chapter 1.11 *WET Testing of Minor Municipal Discharges* in the WET Guidance Document (2019) was consulted because this facility is a minor municipal discharge. No WET testing is recommended because this discharge is comprised solely of domestic wastewater, with no history of WET failures, and no toxic compounds detected at levels of concern.

The recommended limits meet the expression of limits requirements in ss. NR 106.07 and NR 205.065(7), Wis. Adm. Codes, and additional limits are not required.

Please consult the attached report for details regarding the above recommendations. If there are any questions or comments, please contact Sarah Luck (Sarah.Luck@wisconsin.gov) or Diane Figiel (Diane.Figiel@wisconsin.gov).

Attachments (4) – Narrative, Site Map, Ammonia Nitrogen Calculations, and Thermal Table

PREPARED BY:



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Date: December 22, 2021

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**Water Quality-Based Effluent Limitations for  
Lodi Wastewater Treatment Facility**

**WPDES Permit No. WI-0022918-10**

Prepared by: Sarah Luck

**PART 1 – BACKGROUND INFORMATION**

**Facility Description**

The Lodi Wastewater Treatment Facility is a secondary treatment facility with chemical phosphorus removal which receives domestic wastewater. Treatment processes include influent screening, primary settling, packed media tower secondary treatment (RBCs on site are used in backup situations), and chemical phosphorus removal using alum, final clarification, and UV disinfection prior to cascading effluent aeration.

Attachment #2 is a map of the area showing the approximate location of Outfall 001.

**Existing Permit Limitations**

The current permit, expiring on December 31, 2021, includes the following effluent limitations and monitoring requirements.

Parameter	Daily Maximum	Daily Minimum	Weekly Average	Monthly Average	Six-Month Average	Footnotes
Flow Rate						1
BOD <sub>5</sub> May – October			35 mg/L 180 lbs/day	30 mg/L		2
November – April			45 mg/L	30 mg/L		
TSS May – October			35 mg/L 180 lbs/day	30 mg/L		2
November – April			45 mg/L	30 mg/L		
pH	9.0 s.u.	6.0 s.u.				2
Dissolved Oxygen May – October		6.0 mg/L				2
Ammonia Nitrogen May – September	6.3 mg/L		6.3 mg/L	5.2 mg/L		-
October – April	6.3 mg/L		6.3 mg/L	6.3 mg/L		
Fecal Coliform May – September			656#/100 mL geometric mean	400#/100 mL geometric mean		-
Phosphorus				1.0 mg/L 4.8 lbs/day	0.6 mg/L	3

Footnotes:

1. Monitoring only.
2. These limitations are not being evaluated as part of this review. Because the water quality criteria (WQC), reference effluent flow rates, and receiving water characteristics have not changed, limitations for these water quality characteristics do not need to be re-evaluated at this time.

3. Existing concentration limits are already in effect and are maintained to prevent backsliding. There is no phosphorus compliance schedule.

### Receiving Water Information

- Name: Spring Creek
- Waterbody Identification Code (WBIC): 1261900
- Classification used in accordance with chs. NR 102 and 104, Wis. Adm. Code: Coldwater Community, Class II trout water, non-public water supply.
- Low Flows used in accordance with chs. NR 106 and 217, Wis. Adm. Code: The following 7-Q<sub>10</sub> and 7-Q<sub>2</sub> values are estimated by USGS in the October 2012 memorandum. This estimation is for Spring Creek, approximately 250 ft south of Pleasant St. Bridge, which is approximately one mile upstream of the outfall.  
     7-Q<sub>10</sub> (annual) = 11 cfs (cubic feet per second)  
     7-Q<sub>2</sub> (annual) = 12 cfs  
     Harmonic Mean Flow = cfs using a drainage area of 37 mi<sup>2</sup>  
     The Harmonic Mean has been estimated based on average flow and the 7-Q<sub>10</sub> using an equation from U.S. EPA's *Technical Support Document for Water Quality-Based Toxics Control* (March 1991, EPA/505/2-90-001, pgs. 88-89).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7-Q <sub>10</sub> (cfs)	13	13	15	18	15	13	13	13	13	14	15	13
7-Q <sub>2</sub> (cfs)	14	14	17	19	17	16	15	15	15	15	16	15

- Hardness = 321 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of data from WET testing (n = 3) conducted from August 2010 – September 2012 at Lodi Canning Company. Lodi Canning is upstream of the discharge location, so the background hardness is representative of the conditions at Lodi WWTF's outfall.
- % of low flow used to calculate limits in accordance with s. NR 106.06 (4) (c) 5., Wis. Adm. Code: 25%
- Source of background concentration data: Chloride and copper data from Spring Creek upstream at the Riddle Road bridge is used for this evaluation. Background concentration data for other substances are not needed when the respective substance is not detected in the effluent. Background data for calculating effluent limitations for ammonia nitrogen are described later.
- Multiple dischargers: Lodi Canning Company, which is a seasonal discharger, discharges approximately one mile upstream of Outfall 001. The mixing zones do not overlap and therefore the other discharge does not impact this evaluation.
- Impaired water status: Spring Creek is not listed as an impaired water. Approximately 4.5 miles downstream, Lake Wisconsin is listed as impaired for a number of pollutants including phosphorus. This discharge is included in the Wisconsin River Basin TMDL as approved by EPA.

### Effluent Information

- Flow rate:  
     Design annual average = 0.542 MGD (Million Gallons per Day)  
     For reference, the actual average flow from January 2017 through October 2021 was 0.337 MGD.
- Hardness = 281 mg/L as CaCO<sub>3</sub>. This value represents the geometric mean of data from August and September 2021 reported on the permit application (n=2). Two other samples were reported as <0.084

Attachment #1

mg/L but are not considered representative and were not included in the calculation of effluent hardness. For reference, the hardness value used in the previous permit term was 307 mg/L as CaCO<sub>3</sub>.

- Acute dilution factor used in accordance with s. NR 106.06(3)(c), Wis. Adm. Code: Not applicable – this facility does not have an approved Zone of Initial Dilution (ZID).
- Water source: Domestic wastewater with water supply from wells.
- Additives: Alum (phosphorus removal)
- Total Phosphorus Wasteload Allocation (site specific): 605 lbs/year = 1.66 lbs/day (see Appendix K of the TMDL document).
- Effluent characterization: This facility is categorized as a minor municipality, so the permit application required effluent sample analyses for a limited number of common pollutants, as specified in s. NR 200.065, Table 1, Wis. Adm. Code, primarily metal substances plus ammonia, chloride, hardness and phosphorus.
- Effluent data for substances for which a single sample was analyzed is shown in the tables in Part 2 below, in the column titled “MEAN EFFL. CONC.”. Otherwise, substances with multiple effluent data are shown in the tables below or in their respective parts in this evaluation.

Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)	Sample Date	Copper (µg/L)
08/03/2021	7.6	08/19/2021	6.5	09/04/2021	9.1
08/07/2021	8.8	08/23/2021	11.7	09/08/2021	<5.2
08/11/2021	12.6	08/27/2021	5.9	09/12/2021	<5.2
08/15/2021	9.3	08/31/2021	7.4		
Average = 7.2 µg/L					

“<” indicates that the pollutant was not detected at the indicated level of detection. The average concentration was calculated using zero in place of the non-detected results.

Sample Date	Chloride (mg/L)
08/31/2021	270
09/04/2021	450
09/08/2021	310
09/12/2021	240
Average	318

*More information below the tables in Part 2.*

The following table presents the average concentrations and loadings at Outfall 001 from January 2017 through October 2021 for all parameters with limits in the current permit to meet the requirements of s. NR 201.03(6), Wis. Adm. Code:

**Parameter Averages with Limits**

	Average Measurement	Average Mass Discharged
BOD <sub>5</sub>	12 mg/L	32 lbs/day
TSS	11 mg/L*	31 lbs/day
pH field	7.7 s.u.	
Phosphorus	0.49 mg/L	1.38 lbs/day
Ammonia Nitrogen	0.36 mg/L	
Dissolved Oxygen	7.5 mg/L	

\*Results below the level of detection (LOD) were included as zeroes in calculation of average.

## **PART 2 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR TOXIC SUBSTANCES – EXCEPT AMMONIA NITROGEN**

Permit limits for toxic substances are required whenever any of the following occur:

1. The maximum effluent concentration exceeds the calculated limit (s. NR 106.05(3), Wis. Adm. Code)
2. If 11 or more detected results are available in the effluent, the upper 99<sup>th</sup> percentile (or P<sub>99</sub>) value exceeds the comparable calculated limit (s. NR 106.05(4), Wis. Adm. Code)
3. If fewer than 11 detected results are available, the mean effluent concentration exceeds 1/5 of the calculated limit (s. NR 106.05(6), Wis. Adm. Code)

### **Acute Limits based on 1-Q<sub>10</sub>**

Daily maximum effluent limitations for toxic substances are based on the acute toxicity criteria (ATC), listed in ch. NR 105, Wis. Adm. Code. Previously daily maximum limits for toxic substances were calculated as two times the ATC. However, changes to ch. NR 106, Wis. Adm. Code, (September 1, 2016) require the Department to calculate acute limitations using the same mass balance equation as used for other limits along with the 1-Q<sub>10</sub> receiving water low flow to determine if more restrictive effluent limitations are needed to protect the receiving stream from discharges which may cause or contribute to an exceedance of the acute water quality standards. The mass balance equation is provided below.

$$\text{Limitation} = \frac{(\text{WQC}) (Q_s + (1-f) Q_e) - (Q_s - f Q_e) (C_s)}{Q_e}$$

Where:

WQC = Acute toxicity criterion or secondary acute value according to ch. NR 105, Wis. Adm. Code.

Q<sub>s</sub> = average minimum 1-day flow which occurs once in 10 years (1-day Q<sub>10</sub>)  
if the 1-day Q<sub>10</sub> flow data is not available = 80% of the average minimum 7-day flow which occurs once in 10 years (7-day Q<sub>10</sub>).

Q<sub>e</sub> = Effluent flow (in units of volume per unit time) as specified in s. NR 106.06(4)(d), Wis. Adm. Code.

f = Fraction of the effluent flow that is withdrawn from the receiving water, and

C<sub>s</sub> = Background concentration of the substance (in units of mass per unit volume) as specified in s. NR 106.06(4)(e), Wis. Adm. Code.

If the receiving water is effluent dominated under low stream flow conditions, the 1-Q<sub>10</sub> method of limit calculation produces the most stringent daily maximum limitations and should be used while making reasonable potential determinations. This is not the case for Lodi Wastewater Treatment Facility, and the limits are set based on two times the acute toxicity criteria.

The following tables list the calculated WQBELs for this discharge along with the results of effluent sampling. All concentrations are expressed in terms of micrograms per Liter (µg/L), except for hardness and chloride (mg/L).

### **Daily Maximum Limits based on Acute Toxicity Criteria (ATC)**

RECEIVING WATER FLOW = 8.8 cfs, (1-Q<sub>10</sub> (estimated as 80% of 7-Q<sub>10</sub>)), as specified in s. NR 106.06(3)(bm), Wis. Adm. Code.

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SUBSTANCE	REF. HARD.* mg/L	ATC	MAX. EFFL. LIMIT**	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	1-day P <sub>99</sub>	1-day MAX. CONC.
Arsenic		340	679.6	135.9	<7.7		
Cadmium	281	14.3	28.5	5.7	<0.41		
Chromium	281	4202	8404.8	1681	<1.1		
Copper	281	41.1	77.7	15.5	7.2		
Lead	281	290	580.3	116.1	<1.4		
Nickel	268	1080	2160.6	432	<1.5		
Zinc	281	297	594.2	118.8	<4.5		
Chloride (mg/L)		757	1493.4			595	480

\* The indicated hardness may differ from the effluent hardness because the effluent hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the acute criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

\*\* The  $2 \times$  ATC method of limit calculation yields a more restrictive limit than consideration of ambient concentrations and 1-Q<sub>10</sub> flow rates per the changes to s. NR 106.07(3), Wis. Adm. Code, effective 09/01/2016.

**Weekly Average Limits based on Chronic Toxicity Criteria (CTC)**

RECEIVING WATER FLOW = 2.8 cfs ( $\frac{1}{4}$  of the 7-Q<sub>10</sub>), as specified in s. NR 106.06(4)(c), Wis. Adm. Code

SUBSTANCE	REF. HARD.* mg/L	CTC	MEAN BACK- GRD.	WEEKLY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.	4-day P <sub>99</sub>
Arsenic		148.0		633	126.7	<7.7	
Cadmium	175	3.82		16.35	3.3	<0.41	
Chromium	301	212.56		910	181.9	<1.1	
Copper	321	28.08	2.27	112.7	22.54	7.2	
Lead	321	86.42		369.8	74.0	<1.4	
Nickel	268	120.18		514	102.9	<1.5	
Zinc	321	333.79		1428	285.7	<4.5	
Chloride (mg/L)		395	10.3	1657			464

\* The indicated hardness may differ from the receiving water hardness because the receiving water hardness exceeded the maximum range in ch. NR 105, Wis. Adm. Code, over which the chronic criteria are applicable. In that case, the maximum of the range is used to calculate the criterion.

**Monthly Average Limits based on Wildlife Criteria (WC)**

The effluent characterization did not include any effluent sampling results for substances for which Wildlife Criteria exist.

**Monthly Average Limits based on Human Threshold Criteria (HTC)**

RECEIVING WATER FLOW = 5.1 cfs ( $\frac{1}{4}$  of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HTC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Cadmium	370	2604	520.8	<0.41
Chromium (+3)	3818000	26871574	5374315	<1.1
Lead	140	985	197.1	<1.4
Nickel	43000	302640	60528	<1.5

**Monthly Average Limits based on Human Cancer Criteria (HCC)**

RECEIVING WATER FLOW = 5.1 cfs ( $\frac{1}{4}$  of Harmonic Mean), as specified in s. NR 106.06(4), Wis. Adm. Code.

SUBSTANCE	HCC	MO'LY AVE. LIMIT	1/5 OF EFFL. LIMIT	MEAN EFFL. CONC.
Arsenic	13.3	93.6	18.72	<7.7

In addition to evaluating the need for limits for each individual substance for which HCC exist, s. NR 106.06(8), Wis. Adm. Code, requires the evaluation of the cumulative cancer risk. Because no effluent limits are needed based on HCC, determination of the cumulative cancer risk is not needed per s. NR 106.06(8), Wis. Adm. Code.

**Conclusions and Recommendations**

Based on a comparison of the effluent data and calculated effluent limitations, **effluent limitations are not required.**

Chloride – Considering available effluent data from 2021 that were submitted with the permit application, the mean of the data (n=4) is 318 mg/L. This mean exceeded 1/5<sup>th</sup> of the acute toxicity criteria which is 303 mg/L. However, using older data, shown in the table below, to perform a statistical analysis, there is no reasonable potential for the effluent concentration to exceed the calculated acute limit (n=16). Since there have been no changes in operation, the older data is still considered to be representative of current conditions.

Sample Date	Chloride mg/L	Sample Date	Chloride mg/L	Sample Date	Chloride mg/L
01/23/2015	420	07/23/2015	330	08/31/2021	270
02/19/2015	330	08/20/2015	470	09/04/2021	450
03/20/2015	480	09/17/2015	420	09/08/2021	310
04/22/2015	390	10/06/2015	370	09/12/2021	240
05/18/2015	230	11/13/2015	290		
06/18/2015	420	12/15/2015	250		
1-day P <sub>99</sub> = 595 mg/L					
4-day P <sub>99</sub> = 464 mg/L					

**Chloride monitoring is recommended** to ensure that a minimum of 11 sample results are available at the next permit issuance to meet the data requirements of s. NR 106.85, Wis. Adm. Code.

Mercury – The permit application did not require monitoring for mercury because the Lodi Wastewater Treatment Facility is categorized as a minor facility as defined in s. NR 200.02(8), Wis. Adm. Code. In accordance with s. NR 106.145(3)(a)3, Wis. Adm. Code, a minor municipal discharger shall monitor, and report results of influent and effluent mercury monitoring once every three months if, “there are two or more exceedances in the last five years of the high-quality sludge mercury concentration of 17 mg/kg specified in s. NR 204.07(5), Wis. Adm. Code.” A review of the past five years of sludge characteristics data reveals that all the sample results are within expected analytical ranges and well below the 17 mg/kg level. The average concentration in the sludge from September 2017 through October 2020 was 0.83 mg/kg, with a maximum reported concentration of 1.4 mg/kg. Therefore, **no mercury monitoring is recommended at Outfall 001.**

### PART 3 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR AMMONIA NITROGEN

The State of Wisconsin promulgated revised water quality standards for ammonia nitrogen in ch. NR 105, Wis. Adm. Code, effective March 1, 2004 which includes criteria based on both acute and chronic toxicity to aquatic life. The current permit has daily maximum, weekly average, and monthly average limits. These limits are re-evaluated at this time due to the following changes:

- Subchapter IV of ch. NR 106, Wis. Adm. Code allows limits based on available dilution instead of limits set to twice the acute criteria.
- The maximum expected effluent pH has changed.

#### Daily Maximum Limits based on Acute Toxicity Criteria (ATC)

Daily maximum limitations are based on acute toxicity criteria in ch. NR 105, Wis. Adm. Code, which are a function of the effluent pH and the receiving water classification. The acute toxicity criterion (ATC) for ammonia is calculated using the following equation:

$$\text{ATC in mg/L} = [A \div (1 + 10^{(7.204 - \text{pH})})] + [B \div (1 + 10^{(\text{pH} - 7.204)})]$$

Where:

A = 0.275 and B = 39.0 for a Coldwater Category 1 fishery, and  
pH (s.u.) = that characteristic of the effluent.

The effluent pH data was examined as part of this evaluation. A total of 753 sample results were reported from January 2017 through October 2021. The maximum reported value was 8.3 s.u. (Standard pH Units). The effluent pH was 8.2 s.u. or less 99% of the time. The 1-day P<sub>99</sub>, calculated in accordance with s. NR 106.05(5), Wis. Adm. Code, is 8.3 s.u. The mean plus the standard deviation multiplied by a factor of 2.33, an estimate of the upper ninety ninth percentile for a normally distributed dataset, is 8.2 s.u. Therefore, a value of 8.2 s.u. is believed to represent the maximum reasonably expected pH, and therefore most appropriate for determining daily maximum limitations for ammonia nitrogen. Substituting a value of 8.2 s.u. into the equation above yields an ATC = 3.8 mg/L.

#### Potential Changes to Daily Maximum Ammonia Nitrogen Effluent Limitations

Subchapter IV of ch. NR 106, Wis. Adm. Code (effective September 1, 2016) specifies methods for the use of the 1-Q<sub>10</sub> receiving water low flow to calculate daily maximum ammonia nitrogen limits if it is determined that the previous method of acute ammonia limit calculation (2×ATC) is not sufficiently protective of the fish and aquatic life. The more restrictive calculated limits shall apply.

The calculated daily maximum ammonia nitrogen effluent limits using the mass balance approach with the 1-Q<sub>10</sub> (estimated as 80 % of 7-Q<sub>10</sub>) and the 2×ATC approach are shown below.

#### Daily Maximum Ammonia Nitrogen Determination

	Ammonia Nitrogen Limit mg/L
2×ATC	7.7
1-Q <sub>10</sub>	43

The 2×ATC method yields the most stringent limits for Lodi Wastewater Treatment Facility.

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This limit is greater than the current daily maximum limit of 6.3 mg/L. If Lodi Wastewater Treatment Facility would like to request an increase to the existing permit limits an assessment of their effluent data consistent with the requirements of ss. NR 207.04(1)(a) and (c), Wis. Adm. Code, must be provided. This evaluation is on a parameter-by-parameter basis and includes consideration of operations, maintenance, and temporary upsets. Without a demonstration of need for a higher limit in accordance with s. NR 207.04, Wis. Adm. Code, the current limits must be continued in the reissued permit. The Department would be unable to increase the limit due to the lack of need as shown via the antidegradation rule (ch. NR 207, Wis. Adm. Code) because the highest reported concentration was 4.87 mg/L during the previous permit term. No changes are recommended in any of the permit limits for ammonia.

Presented below is a table of daily maximum limitations corresponding to various effluent pH values updated using the 1-Q<sub>10</sub>. Use of this table is not necessarily recommended in the permit, but it is presented herein for informational purposes.

**Daily Maximum Ammonia Nitrogen Limits – Cold water**

Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L	Effluent pH s.u.	Limit mg/L
6.0 ≤ pH ≤ 6.1	72	7.0 < pH ≤ 7.1	44	8.0 < pH ≤ 8.1	9.3
6.1 < pH ≤ 6.2	71	7.1 < pH ≤ 7.2	39	8.1 < pH ≤ 8.2	7.6
6.2 < pH ≤ 6.3	69	7.2 < pH ≤ 7.3	35	8.2 < pH ≤ 8.3	6.3
6.3 < pH ≤ 6.4	67	7.3 < pH ≤ 7.4	31	8.3 < pH ≤ 8.4	5.2
6.4 < pH ≤ 6.5	65	7.4 < pH ≤ 7.5	27	8.4 < pH ≤ 8.5	4.3
6.5 < pH ≤ 6.6	63	7.5 < pH ≤ 7.6	23	8.5 < pH ≤ 8.6	3.5
6.6 < pH ≤ 6.7	60	7.6 < pH ≤ 7.7	19	8.6 < pH ≤ 8.7	3.0
6.7 < pH ≤ 6.8	56	7.7 < pH ≤ 7.8	16	8.7 < pH ≤ 8.8	2.5
6.8 < pH ≤ 6.9	52	7.8 < pH ≤ 7.9	14	8.8 < pH ≤ 8.9	2.1
6.9 < pH ≤ 7.0	48	7.9 < pH ≤ 8.0	11	8.9 < pH ≤ 9.0	1.8

#### Weekly and Monthly Average Limits based on Chronic Toxicity Criteria (CTC)

The weekly and monthly average ammonia nitrogen limits calculation from the previous memo do **not change** because there have been no changes in the effluent and receiving water flow rates. The calculations from the previous WQBEL memo are shown in Attachment #3.

#### Effluent Data

The following table evaluates the statistics based upon ammonia data reported from January 2017 through October 2021, with those results being compared to the calculated limits to determine the need to include ammonia limits in the Lodi Wastewater Treatment Facility permit for the respective month ranges. That need is determined by calculating 99<sup>th</sup> upper percentile (or P<sub>99</sub>) values for ammonia during each of the month ranges and comparing the daily maximum values to the daily maximum limit.

Ammonia Nitrogen mg/L	May – September	October – April
1-day P <sub>99</sub>	1.52	1.28
4-day P <sub>99</sub>	0.82	0.79
30-day P <sub>99</sub>	0.42	0.55
Mean *	0.26	0.43

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Std	0.32	0.24
Sample size	328	427
Range	0.02 - 4.87	0.11 - 2.41

The permit currently has daily, weekly, monthly limits. Where there are existing ammonia nitrogen limits in the permit, the limits must be retained regardless of reasonable potential, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

- (b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

### Conclusions and Recommendations

In summary, after rounding to two significant figures, the following ammonia nitrogen limitations are recommended. No mass limitations are recommended in accordance with s. NR 106.32(5), Wis. Adm Code.

Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
May – September	6.3	6.3	5.2
October – April	6.3	6.3	6.3

## PART 4 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR BACTERIA

On May 1, 2020, revisions to chs. NR 102 and NR 210, Wis. Adm. Codes, became effective which replace fecal coliform limits with new *Escherichia coli* (*E. coli*) limits for protection of recreational uses. Section NR 210.06(2)(a)1, Wis. Adm. Code, includes two limits which must be included in permits for facilities which are required to disinfect:

1. The geometric mean of *E. coli* bacteria in effluent samples collected in any calendar month may not exceed 126 counts/100 mL.
2. No more than 10 percent of *E. coli* bacteria samples collected in any calendar month may exceed 410 counts/100 mL.

*E. coli* monitoring is recommended at the same frequency that fecal coliform monitoring is required in the current permit. Because Lodi Wastewater Treatment Facility's permit requires weekly monitoring, the 410 counts/100 mL limit will effectively function as a daily maximum limit unless the facility performs additional monitoring. Any additional monitoring beyond what is required by the permit must also be reported on the DMR as required in the standard requirements section of the permit.

These limits are required during May through September. No changes are recommended to the current recreational period and the required disinfection season.

### Interim Limit

At this time, there is no effluent *E. coli* data available to determine if these limits are currently met. The permit will include a compliance schedule to meet these limits. During the compliance schedule, an interim limit applies to prevent back-sliding from the current level of disinfection during the compliance

schedule period. Therefore, the current **fecal coliform limit shall be included in the reissued permit as an interim limit of 400 counts/100 mL as a monthly geometric mean**. The weekly geometric mean limit of 656#/100 mL, which was included in the current permit for expression of limits purposes, does not need to be included in the permit as an interim limit.

## **PART 5 – PHOSPHORUS**

### **Technology-Based Effluent Limit**

Subchapter II of Chapter NR 217, Wis. Adm. Code, requires municipal wastewater treatment facilities that discharge greater than 150 pounds of Total Phosphorus per month to comply with a monthly average limit of 1.0 mg/L, or an approved alternative concentration limit.

Since Lodi Wastewater Treatment Facility currently has a limit of 1.0 mg/L, this limit should be included in the reissued permit. This limit remains applicable unless a more stringent WQBEL is given.

In addition, the need for a WQBEL for phosphorus must be considered.

### **TMDL Limits**

The following review is based on the Wisconsin River Basin Total Maximum Daily Load which was developed by the Department. This document can be found at:  
<https://dnr.wi.gov/topic/TMDLs/WisconsinRiver/>.

The Wisconsin River is included in the Wisconsin River TMDL as approved by EPA on April 26, 2019 with site-specific criteria approved by EPA on July 9, 2020. The annual wasteload allocation for Lodi Wastewater Treatment Facility (based on site-specific criteria and listed in Appendix K of the TMDL document) is 605 lbs/year.

Total phosphorus (TP) effluent limits in pounds per day (lbs/day) are calculated as recommended in the *TMDL Development and Implementation Guidance: Integrating the WPDES and Impaired Waters Programs* (May 2020). The wasteload allocations (WLA) that implement site-specific criteria for Lakes Petenwell, Castle Rock, and Wisconsin are found in Appendix K of the *Total Maximum Daily Loads for Total Phosphorus in the Wisconsin River Basin (WRB TMDL)* report dated April 26, 2019 and are expressed as maximum annual loads (lbs/year) and maximum daily loads (lbs/day). The WLA that implement statewide criteria found in Appendix J of the TMDL report are no longer applicable following approval of these site-specific criteria. The daily WLAs in the WRB TMDL equals the annual WLA divided by the number of days in the year. Therefore, the daily WLA is an annual average. Since the derivation of daily WLAs from annual WLAs does not take effluent variability or monitoring frequency into consideration, maximum daily WLAs from the WRB TMDL should not be used directly as permit effluent limits.

For the reasons explained in the April 30, 2012 paper entitled *Justification for Use of Monthly, Growing Season and Annual Average Periods for Expression of WPDES Permit Limits for Phosphorus Discharges in Wisconsin*, the Department has determined that the phosphorus WQBELs set equal to WLAs would not be consistent with the assumptions and requirements of the TMDL. Therefore, limits given to continuously discharging facilities covered by the WRB TMDL are given monthly average mass limits. If the equivalent effluent concentration is less than or equal to 0.3 mg/L, six-month average mass limits are also included. The following equation shows the calculation of equivalent effluent concentration:

Attachment #1

$$\begin{aligned}\text{TP Equivalent Effluent Concentration} &= \text{Daily WLA} \div (\text{Flow Rate} * \text{Conversion Factor}) \\ &= 1.66 \text{ lbs/day} \div (0.542 \text{ MGD} * 8.34) \\ &= 0.367 \text{ mg/L}\end{aligned}$$

Since this value is greater than 0.3 mg/L, the WLA should be expressed as a monthly average mass limit for total phosphorus and no six-month average limit is required.

$$\begin{aligned}\text{TP Monthly Average Permit Limit} &= \text{daily WLA} * \text{monthly average multiplier} \\ &= 1.66 \text{ lbs/day} * 1.22 \\ &= 2.0 \text{ lbs/day}\end{aligned}$$

The multiplier used in the monthly average calculation was used as recommended in TMDL implementation guidance. A coefficient of variation was calculated, based on phosphorus mass monitoring data, to be 0.32. This value, along with monitoring frequency, is used to select the multiplier. The current permit specifies phosphorus monitoring as three times per week; if a different monitoring frequency is used, the stated limits should be reevaluated.

The WRB TMDL establishes TP wasteload allocations to reduce the loading in the entire watershed including WLAs to meet water quality standards for tributaries to the Wisconsin River. Therefore, WLA-based WQBELs are protective of immediate receiving waters and TP WQBELs derived according to s. NR 217.13, Wis. Adm. Code are not required.

Since WLAs are expressed as annual loads (lbs/yr), permits with TMDL-derived monthly average permit limits should require the permittee to calculate and report rolling 12-month sums of total monthly loads for TP. Rolling 12-month sums can be compared directly to the annual wasteload allocation.

### Effluent Data

The following table lists the statistics for effluent phosphorus levels from January 2017 through October 2021.

Total Phosphorus Statistics		
	Concentration mg/L	Mass Discharge lbs/day
1-day P <sub>99</sub>	0.89	2.7
4-day P <sub>99</sub>	0.67	2.0
30-day P <sub>99</sub>	0.55	1.6
Mean	0.49	1.4
Std	0.14	0.4
Sample Size	757	757
Range	0.23 - 1.5	0.5 - 4.93

### Conclusions

In summary, the following limits are recommended by this evaluation:

- Monthly average total phosphorus mass limit of 2.0 lbs/day. The last five years of data shows 100% compliance with this limit.
- Monthly average total phosphorus concentration limit of 1.0 mg/L (based on the TBEL and already

in effect; retained to prevent backsliding).

- Six-month average total phosphorus concentration limit of 0.6 mg/L (limit already in effect; retained to prevent backsliding).

## **PART 6 – WATER QUALITY-BASED EFFLUENT LIMITATIONS FOR THERMAL**

Surface water quality standards for temperature took effect on October 1, 2010. These regulations are detailed in chs. NR 102 (Subchapter II – Water Quality Standards for Temperature) and NR 106 (Subchapter V – Effluent Limitations for Temperature) of the Wisconsin Administrative Code. Daily maximum and weekly average temperature criteria are available for the 12 different months of the year depending on the receiving water classification.

In accordance with s. NR 106.53(2)(b), Wis. Adm. Code, the highest daily maximum flow rate for a calendar month is used to determine the acute (daily maximum) effluent limitation. In accordance with s. NR 106.53(2)(c), Wis. Adm. Code, the highest 7-day rolling average flow rate for a calendar month is used to determine the sub-lethal (weekly average) effluent limitation. These values were based off actual flow reported from January 2017 through October 2021.

Lodi Wastewater Treatment Facility last monitored effluent temperature from January 2012 through August 2016 (shown below). Since there have been no changes to the treatment process or the receiving water characteristics, this data is considered representative.

**Monthly Temperature Effluent Data & Limits**

Month	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Weekly Maximum	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)	(°F)
JAN	57	57	107	120
FEB	55	58	107	120
MAR	61	61	93	114
APR	61	61	116	120
MAY	65	65	97	120
JUN	70	75	95	120
JUL	71	71	80	100
AUG	71	72	76	114
SEP	70	72	77	120
OCT	65	67	71	120
NOV	64	64	93	120
DEC	59	59	104	120

### **Reasonable Potential**

Permit limits for temperature are recommended based on the procedures in s. NR 106.56, Wis. Adm.

Code.

- An acute limit for temperature is recommended for each month in which the representative daily maximum effluent temperature for that month exceeds the acute WQBEL. The representative daily maximum effluent temperature is the greater of the following:
  - (a) The highest recorded representative daily maximum effluent temperature
  - (b) The projected 99th percentile of all representative daily maximum effluent temperatures
- A sub-lethal limitation for temperature is recommended for each month in which the representative weekly average effluent temperature for that month exceeds the weekly average WQBEL. The representative weekly average effluent temperature is the greater of the following:
  - (a) The highest weekly average effluent temperature for the month.
  - (b) The projected 99th percentile of all representative weekly average effluent temperatures for the month

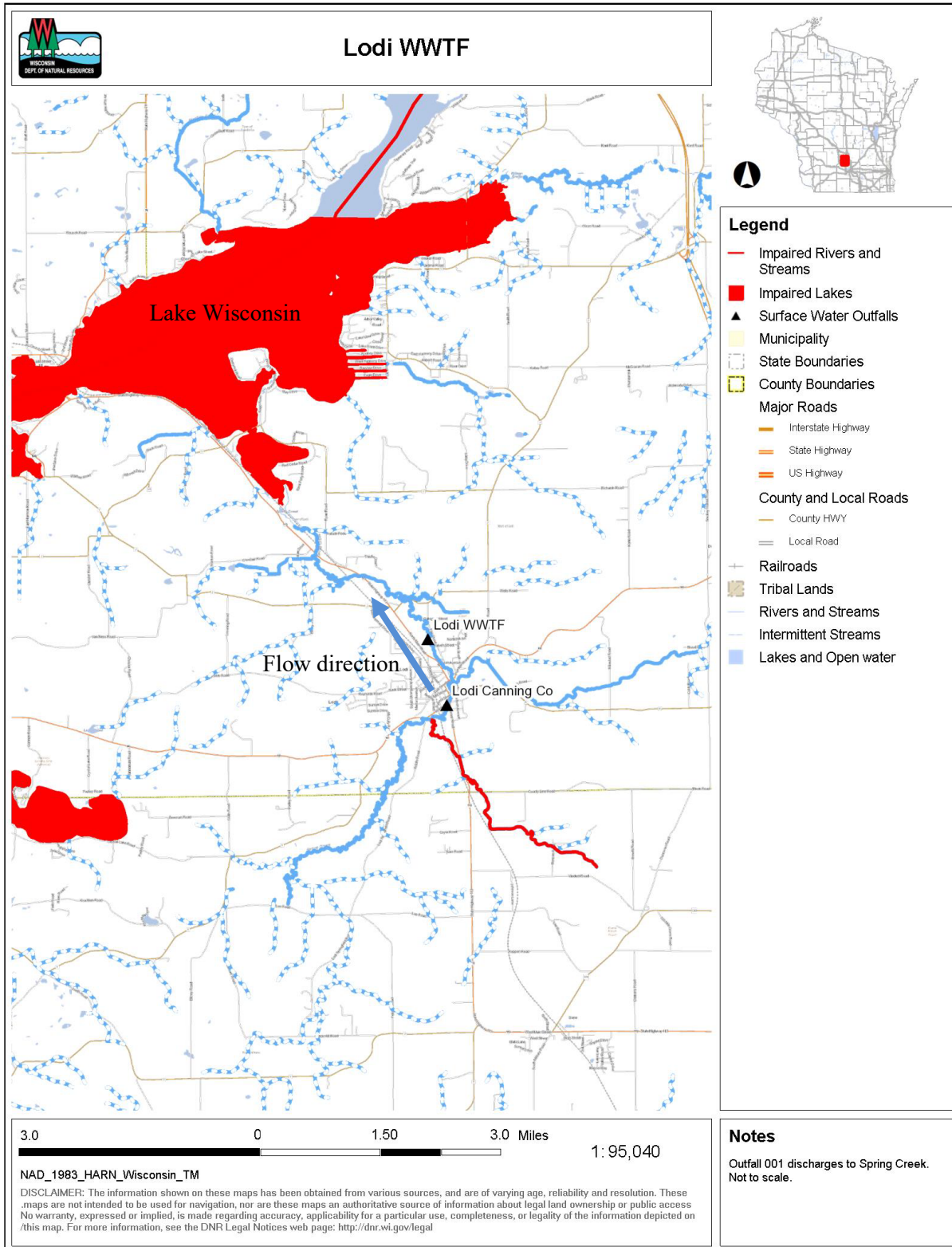
Comparing the representative highest effluent temperature to the calculated effluent limits determines the reasonable potential of exceeding the effluent limits. As shown in the table above, the highest reported value was 71°F. Therefore, **no temperature limits or monitoring are recommended**. The complete thermal table used for this calculation is in Attachment #4.

#### **PART 7 – WHOLE EFFLUENT TOXICITY (WET)**

WET testing is used to measure, predict, and control the discharge of toxic materials that may be harmful to aquatic life. In WET tests, organisms are exposed to a series of effluent concentrations for a given time and effects are recorded. Decisions below related to the selection of representative data and the need for WET limits were made according to ss. NR 106.08 and 106.09, Wis. Adm. Code. WET monitoring frequency and toxicity reduction evaluation (TRE) recommendations were made using the best professional judgment of staff familiar with the discharge after consideration of the guidance in the *Whole Effluent Toxicity (WET) Program Guidance Document (October 29, 2019)*.

Guidance in Chapter 1.11 of the WET Guidance Document (WET Testing of Minor Municipal Discharges) was consulted. This is a minor municipal discharge (< 1.0 MGD) comprised solely of domestic wastewater, with no history of WET failures and no toxic compounds detected at levels of concern. **No WET testing is recommended at this time** because of the low risk in effluent toxicity.

# Attachment #2 Site Map



### Ammonia Nitrogen Calculations

Ammonia limits were last calculated in the WQBEL Memo dated October 31, 2016. These limits were evaluated both for the immediate coldwater receiving water as well as for Lake Wisconsin, which is approximately 4.5 miles downstream. However, both of these evaluations resulted in limits less stringent than those already in place, and there was not reasonable potential to include new limits. Instead, revisions to ch. NR 106, Wis. Adm. Code, which align Wisconsin's water quality-based effluent limitations with 40 CFR 122.45(d), requires that WPDES permits contain weekly average and monthly average limitations whenever limitations are determined to be necessary.

#### Additional Ammonia Limitations Needed to Comply with s. NR 106.07, Wis. Adm. Code, Expression of Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
Year Round	6.3	6.3	6.3
May-September		14.5*	5.2

\*Since the conversion of the daily max limit to weekly average limit (equal to the daily maximum limit of 6.3 mg/L) is a more stringent limit than the monthly average converted to a weekly average limit (14.5 mg/L), the most stringent limit of 6.3 mg/L should be included in the permit.

Thus, the following permit limits were recommended and shall remain, consistent with s. NR 106.33(1)(b), Wis. Adm. Code:

(b) If a permittee is subject to an ammonia limitation in an existing permit, the limitation shall be included in any reissued permit. Ammonia limitations shall be included in the permit if the permitted facility will be providing treatment for ammonia discharges.

#### Final Ammonia Nitrogen Limits

	Daily Maximum mg/L	Weekly Average mg/L	Monthly Average mg/L
May – September	6.3	6.3	5.2
October – April	6.3	6.3	6.3

### Temperature limits for receiving waters with unidirectional flow

(calculation using default ambient temperature data)

<b>Facility:</b>	Lodi WWTF	<b>7-Q<sub>10</sub>:</b>	11	cfs	<b>Temp Dates</b>	<b>Flow Dates</b>
<b>Outfall(s):</b>	001	<b>Dilution:</b>	25%		<b>Start:</b>	01/01/12
<b>Date Prepared:</b>	12/3/2021	<b>f:</b>	0		<b>End:</b>	08/31/16
<b>Design Flow (Q<sub>e</sub>):</b>	0.542	<b>Stream type:</b>	Cold water community			
<b>Storm Sewer Dist.</b>	0	<b>Qs:Q<sub>e</sub> ratio:</b>	3.3	:1		
		<b>Calculation Needed?</b>	YES			

Month	Water Quality Criteria			Receiving Water Flow Rate (Qs) (cfs)	Representative Highest Effluent Flow Rate (Qe)		f	Representative Highest Monthly Effluent Temperature		Calculated Effluent Limit	
	Ta (default)	Sub-Lethal WQC	Acute WQC		7-day Rolling Average (Qesl)	Daily Maximum Flow Rate (Qea)		Weekly Average	Daily Maximum	Weekly Average Effluent Limitation	Daily Maximum Effluent Limitation
	(°F)	(°F)	(°F)		(MGD)	(MGD)		(°F)	(°F)	(°F)	(°F)
JAN	35	47	68	13	0.421	0.520	0	57	57	107	120
FEB	36	47	68	13	0.386	0.457	0	55	58	107	120
MAR	39	51	69	15	0.689	1.612	0	61	61	93	114
APR	47	57	70	18	0.492	0.545	0	61	61	116	120
MAY	56	63	72	15	0.500	0.708	0	65	65	97	120
JUN	62	67	72	13	0.370	0.399	0	70	75	95	120
JUL	64	67	73	13	0.476	0.712	0	71	71	80	100
AUG	63	65	73	13	0.377	0.510	0	71	72	76	114
SEP	57	60	72	13	0.366	0.451	0	70	72	77	120
OCT	49	53	70	14	0.497	0.767	0	65	67	71	120
NOV	41	48	69	15	0.380	0.410	0	64	64	93	120
DEC	37	47	69	13	0.365	0.427	0	59	59	104	120